DOCUMENT RESUME

ED 097 494 CE 002 262

TITLE	Aircraft Sheet Metal Practices, Blueprint Reading, Sheet Metal Forming and Heat Treating; Sheet Metal Work 2: 9855.04.
INSTITUTION	Dade County Public Schools, Miami, Fla.
PUB DATE	Feb 74
NOTE	17p.; An Authorized Course of Instruction for the Quinmester Program
EDRS PRICE	MF-$0.75 HC-$1.50 PLUS POSTAGE
DESCRIPTORS	Course Content; Course Objectives; *Curriculum Guides; *Metal Working Occupations; Post Secondary Education; Secondary Grades; *Sheet Metal Work; *Trade and Industrial Education; Vocational Education
IDENTIFIERS	Florida; *Quinmester Program

ABSTRACT

This course is designed to familiarize vocational students with construction in sheet metal layout. The document outlines goals, specific block objectives, layout practices, blueprint reading, sheet metal forming (by hand and by machine), and heat treatment of metals, and includes posttest samples. Layout techniques and air foil developing are emphasized. A bibliography is appended. (NH)

ED 097494

CE

BEST COPY AVAILABLE

AUTHORIZED COURSE OF INSTRUCTION FOR THE QUINMESTER PROGRAM

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

Course Outline

SHEET METAL WORK 2
(Aircraft Sheet Metal Practices, Blueprint Reading, Sheet Metal Forming and Heat Treating)

Department 48 - Quin 9855.04

CE 002 262

DADE COUNTY PUBLIC SCHOOLS
DIVISION OF INSTRUCTION • 1974

ED 097494

BEST COPY AVAILABLE

DADE COUTY PUBLIC SCHOOLS

1450 NORTHEAST SECOND AVENUE

MIAMI, FLORIDA 33132

Course Outline

SHEET METAL WORK 2
(Aircraft Sheet Metal Layout Practices, Blueprint Reading, Sheet Metal Forming and Heat Treating)

Department 48 - Quin 9855.04

county office of

VOCATIONAL AND ADULT EDUCATION

THE SCHOOL BOARD OF DADE COUNTY

Mr. G. Holmes Braddock, Chairman
Mr. William H. Turner, Vice-Chairman
Mrs. Ethel Beckham
Mr. Alfredo G. Duran
Mrs. Phyllis Miller
Mr. Robert Renick
Dr. Ben Sheppard

Dr. E. L. Whigham, Superintendent of Schools
Dade County Public Schools
Miami, Florida 33132

February, 1974

Published by the School Board of Dade County

Course Description

9855	48	9855.04	Aircraft Sheet Metal Layout Practice, Blueprint Reading Sheet Metal Forming and Heat Treating
State Category Number	County Dept. Number	County Course Number	Course Title

The objective of this quin course is to familiarize the vocational student with construction in sheet metal layout using parallel line, radial line, and triangulation developments. Emphasis will be placed on the use of layout techniques and air foil developing. The manufacture of parts and the heat treating of metals will also receive great emphasis.

Indicators of Success: Prior to entry into this course, the vocational student will display mastery of the skills indicated in Aircraft Assembly, Riveting and Surface Repair II (9855.03).

Clock Hours: 135

BEST COPY AVAILABLE

PREFACE

The following outline is for a fourth quinmester course. Prior to entry into this course, the student must display mastery of the skills indicated in Aircraft Assenbly, Riveting and Surface Repair II (9855.03).

This course will serve as a guide to the student who wishes to pursue the field of sheet metal work - intermediate. It is composed of five blocks of instruction which are subdivided into several units each, requiring one quinmester of 135 hours.

In presenting the material outlined in this course, the instructor uses the lecture and demonstration methods with emphasis on the use of visual aids, mock-ups, cutaways, transparencies, films and manipulative shop practice.

No basic textbook is required for the course, however, the bibliography which appears on the last pages of the outline lists the reference books, manuals and other materials that are used throughout the course by both the student and the instructor.

This outline was developed through the cooperative efforts of the instructional and supervisory personnel, the Quinmester Advisory Committee, and Vocational Curriculum Materials Service, and has been approved by the Dade County Vocational Curriculum Committee.

BEST COPY AVAILABLE

TABLE OF CONTENTS
With Suggested Hourly Breakdown

	Page
PREFACE	i
GOALS	iii
SPECIFIC BLOCK OBJECTIVES	iv
BIBLIOGRAPHY	3
BLOCK	
I. LAYOUT PRACTICES (60 Hours)	
Laying Out Flat Patterns	1
Laying Out Irregular Patterns	1
Using Templates for Layout	1
Laying Out Airfoils	1
II. BLUEPRINT READING (30 Hours)	
Shop Sketching	1
Blueprint Reading Techniques	1
III. SHEET METAL FORMING (30 Hours)	
Forming by Hand Methods	1
Forming by Machine Methods	2
IV. HEAT TREATMENT OF METALS (15 Hours)	
Heat Treating Aluminum Parts	2
Heat Treatment of Steel	2
V. QUINMESTER POSTTEST	
APPENDIX: QUINMESTER POSTTEST SAMPLE	7

GOALS

The student must be able to display:

1. The skills and knowledge necessary to do sheet metal layout.
2. The ability to read and understand blueprints.
3. The ability to perform hand and machine forming.
4. Techniques used in heat treating methods.
5. The ability to assume the responsibility inherent in the sheet metal technician occupation.

SPECIFIC BLOCK OBJECTIVES

BLOCK I - LAYOUT PRACTICES

The student must be able to:

1. Demonstrate the ability to layout flat and irregular patterns of the sheet metal trade.
2. Exhibit the ability of using templates for layout.
3. Demonstrate the ability to layout an air foil.

BLOCK II - BLUEPRINT READING

The student must be able to:

1. Exhibit the ability to do sheet metal shop sketching.
2. Exhibit the skills and ability to interpret all types of blueprints.

BLOCK III - SHEET METAL FORMING

The student must be able to:

1. Demonstrate metal forming by hand.
2. Exhibit the ability to do metal forming by machine process.
3. State the methods of annealing work hardened aluminum.

BLOCK IV - HEAT TREATMENT OF METALS

The student must be able to:

1. State the reasons for heat treating steel and aluminum parts.
2. Demonstrate the ability to perform simple heat treating processes.
3. Explain several methods of aging metals.

BLOCK V - QUINMESTER POSTTEST

The student must be able to:

1. Satisfactorily complete the quinmester posttest.

Course Outline

SHEET METAL WORK - INTERMEDIATE
(Aircraft Sheet Metal Layout Practices, Blueprint Reading,
Sheet Metal Forming and Heat Treating)

Department 48 - Quin 9855.04

I. LAYOUT PRACTICES

A. Laying Out Flat Patterns
1. Bend lines and relief holes
2. Angles
3. Curves

B. Laying Out Irregular Patterns
1. Intersections
2. Tapering sections
3. Transition pieces

C. Using Templates for Layout
1. Laying out templates
2. Trimming out templates
3. Using template to lay out parts

D. Laying Out Airfoils
1. Developing from table of ordinates
2. Developing from duplicate parts
3. Developing by use of templates

II. BLUEPRINT READING

A. Shop Sketching
1. Alphabet of lines
2. Oblique sketches
3. Dimension of sketches
4. Orthographic projection

B. Blueprint Reading Techniques
1. Techniques of showing hidden edges of components
2. Techniques of showing hidden areas of aircraft
3. Reading title blocks
4. Reading symbols

III. SHEET METAL FORMING

A. Forming by Hand Methods
1. Interpreting drawings and specifications
2. Securing information from original or template
3. Selecting and preparing metal for new part
4. Forming and shaping part by using
   a. A mallet
   b. Forming hammers

c. Dollies
d. Wood form block
e. Sandbag
f. Shrinking block
g. V block
h. Stakes

B. Forming by Machine Methods
1. Securing information from drawings template or original part
2. Laying out new part
3. Fabricating new part
4. Shaping new part by using
a. Forming roll
b. Bending brake
c. Power hammer
d. ERCO former
e. Bending machine
f. Shrinker
g. Stretcher

IV. HEAT TREATMENT OF METALS

A. Heat Treating Aluminum Parts
1. Hardening aluminum in the heat treat furnace
2. Quenching heat treated parts
3. Straightening warped areas in heat treated parts
4. Aging heat treated parts

B. Heat Treatment of Steel
1. Heat treating steel
2. Annealing steel
3. Normalizing steel
4. Case hardening steel
5. Quenching steel after heat treating

V. QUINMESTER POSTTEST

BIBLIOGRAPHY
(Aircraft Sheet Metal Layout Practices, Blueprint Reading, Sheet Metal Forming and Heat Treating)

Basic References:

None

Supplementary References:

1. Aircraft Template Developments. Los Angeles: Aero Publishers, Inc., 1942. Pp. 306.

2. U.S. Federal Aviation Agency. Airframe and Power Plant Mechanics Airframe Handbook AC-65-15. Washington, D.C.: U.S. Government Printing Office, 1972. Pp. 538.

3. Airframe and Power Plant Mechanics General Handbook AC-65-9. Washington, D.C.: U.S. Government Printing Office, 1970. Pp. 497.

4. Forming Manual. Salt Lake City, Utah: State Board of Vocational Education, 1942. Pp. 278.

5. Fundamentals of Airframe Maintenance. Dept. of the Army. Washington, D.D.: U.S. Government Printing Office, 1965. Pp. 431.

6. Hand Process Handbook. Albany, New York: Delmar Publishers, Inc., 1946. Pp. 146.

7. Hayes, J. T. Shop Sketching and Blueprint Reading Made Easy. Cincinnati: Technology Text Book Company, 1951. Pp. 148.

8. Machine Process Handbook. Albany, New York: Delmar Publishers Inc., 1946. Pp. 86.

9. Measurement and Layout. Albany, New York: Delmar Publishers, Inc., 1946. Pp. 89.

10. U.S. Air Force. Airframe Maintenance Air Force Manual 52-11. Washington, D.C.: U.S. Government Printing Office, 1964. Pp. 314.

Films:

1. Forming Aluminum. 16 mm. 20 min. B/W. Sound. n.d. Alcoa.

A P P E N D I X

Quinmester Post-Test Sample

QUINMESTER POST-TEST

Name _____ Date _____ Score ____

Multiple Choice Test Items

Each statement needs a word, a figure, or a phrase to make it correct. Only one of the choices listed is correct. Place the letter of the choice you make in the space provided at the left edge of the sheet.

____ 1. In general "layout" can be divided into how many methods:

a. Two
b. Three
c. One
d. Four

____ 2. The method used in "layout" depends on:

a. Thickness of paper
b. Width of paper
c. Type of job
d. All of the above

____ 3. When laying out cylindrically shaped jobs, the length of the pattern must be found. This can be done by:

a. Computation
b. Using tables
c. Using circumference rule
d. All of the above

____ 4. In "layout," after the size of the stretchout is found you must allow for:

a. Edges and gussets
b. Edges and seams
c. Stretchout takes all allowances in consideration
d. Laps and cut outs

____ 5. The length of the stretchout of a square job is equal to:

a. Sum of the sides
b. (4) times the length of one side
c. Sum of one side times (2)
d. One and two

____ 6. The circumference of a circle is equal to 3.1416 times the:

a. Diameter
b. Width
c. Height
d. None of the above

____ 7. Jobs that have the opposite sizes parallel (such as square, rectangular, and cylindrical shapes), and cut at an angle, must be laid out on a flat surface by the:

a. Triangulation method
b. Radial line method
c. Parallel line method
d. Simple layout method

____ 8. The riveted lap seam is:

a. Weaker than soldered lap seam
b. Stronger than soldered lap seam
c. Equal to soldered lap seam
d. Never used

____ 9. When laying out sheet metal jobs, which view is generally drawn first?

a. Front view
b. Top view
c. Side view
d. Bottom view

____10. Jobs with sides tapered must be laid out by what method?

a. Simple layout
b. Parallel
c. Radial line and triangulation
d. Pattern

____11. If a blueprint indicates that the scale is one inch equals two inches, each line of the print is shown as:

a. One-half its actual length
b. Twice its actual length
c. The same as its actual length
d. One-half its actual thickness

____12. In order to make a blueprint from a drawing, it is necessary to make:

a. A transparency
b. A carbon copy
c. A tracing
d. A xerox copy

____13. Which one of the following rules is observed in order to preserve a blueprint:

a. Keep them in a well-lighted room
b. Keep them permanently moistened
c. Keep them in a dark, dry location
4. Keep them in a well-ventilated location

___14. Blueprints are:

a. Reproduced copies of mechanical drawings
b. Water color reproductions
c. Ozalids
d. Photographs from an object

___15. A working drawing or print must contain which of the following items:

a. Notes and dimensions
b. The draftsman's name
c. All demensions in decimals
d. All demensions in fractions

___16. The "title block" on a print is sometimes referred to as the:

a. Bill of material
b. Headline
c. Revision block
d. Legend

___17. All metal forming revolves around the process of:

a. Shrinking
b. Stretching
c. Shrinking and bending
d. Stretching and shrinking

___18. Bumping must be done on:

a. Form block
b. Female die
c. Sandbag
d. All of the above

___19. An offset formed on an angle strip to allow clearance for a sheet or an extrusion is called:

a. A joggle
b. A gusset
c. A seam
d. A joint

___20. Shaping or forming malleable metal by hammering or pounding is called:

a. Crimping
b. Folding
c. Bumping
d. Bending

____21. The method used to relieve stresses in iron-base metals is called:

a. Dimpling
b. Cold working
c. Normalizing
d. Case hardening

____22. All heat treating operations are concerned with:

a. Time, temperature and atmosphere
b. Type of furnace and temperature
c. Metal thickness and time
d. Temperature and time

____23. Doubling the tensile strength of pure aluminum is done by:

a. Cold working
b. Heat treatment
c. Water quenching
d. Extruding

____24. When 24SO is used in the construction of aircraft. The suffix "O" means:

a. Annealed
b. 1/2 hard
c. Heat treated
d. Strain hardened

____25. The five basic stress which metals must withstand are:

a. Shear, bending, compression, tension and torsion
b. Torsion, compression, shear, bending and expansion
c. Torsion, compression, tension, bending and fusibility
d. Bending, compression, shear, tension and stretching

ANSWER KEY TO QUINMESTER POSTTEST

Multiple Choice Test Items

1. d
2. c
3. d
4. b
5. d
6. a
7. c
8. b
9. a
10. c
11. a
12. c
13. c
14. a
15. a
16. d
17. d
18. d
19. a
20. c
21. c
22. d
23. b
24. a
25. a